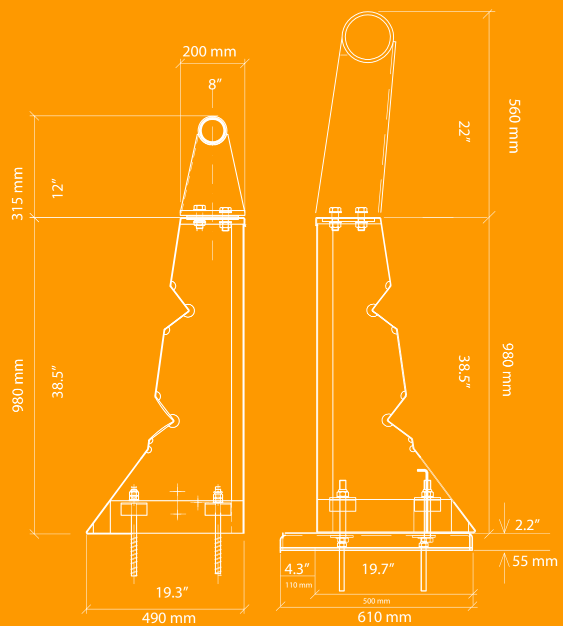
FHWA Approved



MDS TL4 MDS TL5

HIGH PERFORMANCE Road & Bridge Steel Safety BARRIER

Designed with Progressive SRS©
Stress Reduction System

MDS® TL4 & TL5

BRIDGE DECK IMPACT TRANSMISSION FORCES

With Progressive Stress Reduction System©

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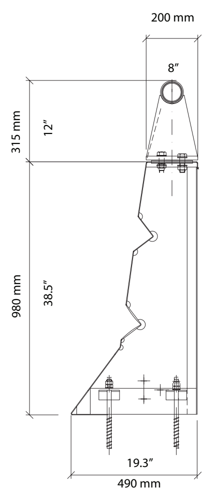
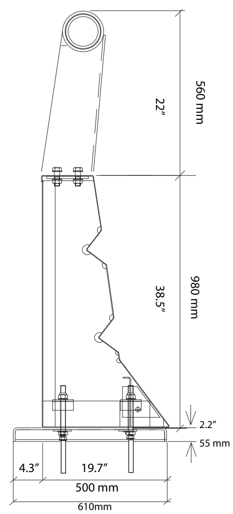
Introduction

MDS® BARRIERS has completed crash testing specifically for bridge deck stress forces which were not known until now unless estimated by a mathematical calculation. Today MDS® BARRIERS provides real life deck stress test data values helping engineers quickly determine if the level of impact at TL4 and TL5 is well below the bridges design resistance. Utilizing a barrier that may contain a vehicle but exceed the design resistance forces of the bridge deck can create hidden structural damage further weakening the bridge deck.
Rehabilitating bridges is a continuous ongoing engineering task, knowing the horizontal, vertical and moment stress force values helps solve the mysteries of estimating deck strength at any given time.



MDS TL4

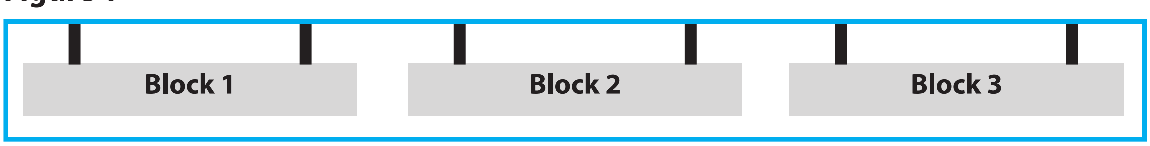


MDS TL5

Impact transmission forces into a bridge deck

Test Deck Design
The MDS® BARRIER is anchored on an edge slab, having the length of 12 m. The edge slab is supported by 3 identical concrete cantilever slabs (block 1, block 2 and block 3), each being 4 m long.

Figure 1



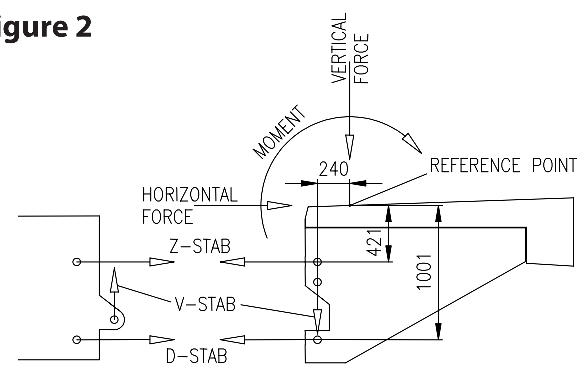
MDS® BARRIERS
Road and Bridge Barrier Systems

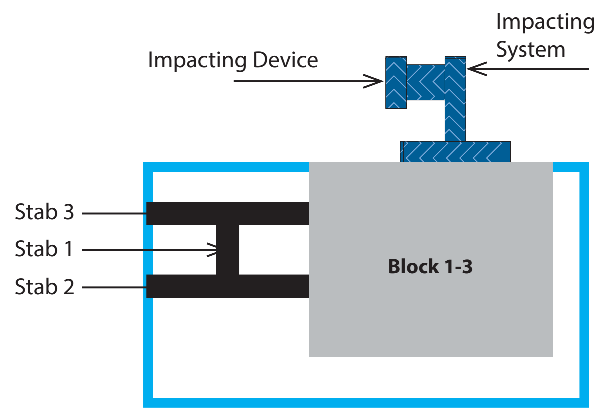
Test Data

The loads acting on bridge deck were measured by BASt, in test TB 51 for the MDS TL4 H2 barrier and in test TB 81 for the MDS TL5 H4 barrier. The measurements were taken by 18 dynamometers over a length of 12 m of the bridge deck. The forces measured by the dynamometers are indicated as Z-Stab, V-Stab and D-STAB in figure 2. From the time history of such forces, the horizontal force, the vertical force and the moment were then computed, per unit deck length, for the two tests.

> **NOTE**
> *Figures 1-5 illustrate the design of the test deck and how the crash test deck loads were measured and recorded, not how they would be installed in the field.*

Figure 2





Each of the test deck measuring suspension blocks includes 3 dynamometer rods:

V-STAB (Stab 1 in Figure 2) vertical;
D-STAB (Stab 2 in Figure 2) horizontal, 1001 mm below the reference point;
Z-STAB (Stab 3 in Figure 2) horizontal, 421 mm below the reference point.

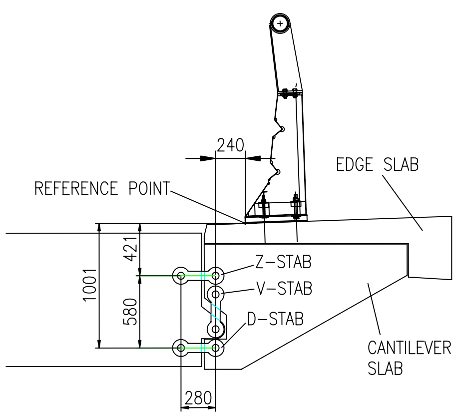


Figure 3

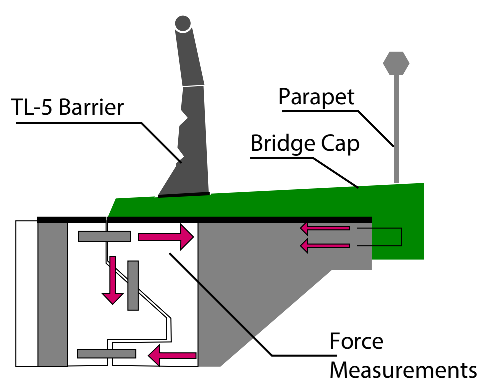


Figure 4

Figure 3 & 4 shows a cross section of the barrier installation with the location and the dimensions of the test deck measuring suspensions (2 for each cantilever slab). Figure 5 shows one concrete cantilever slab, before installation, with its two measuring suspensions.

The loads are reduced to two forces applied to the Reference Point, plus a moment about the same point. The Reference Point is located at the extreme position of the barrier on traffic side, at pavement level. The measurements from dynamometer rods are positive for rod in tension and negative for compression.

Figure 5
Reinforced concrete cantilever slab fixed on 2 measuring suspensions

Impact Force Test Results

MDS TL4 BRIDGE DECK IMPACT FORCES	
HORIZONTAL FORCE	57.1 kN/m
VERTICAL FORCE	46.8 kN/m
MOMENT	57.2 kNm/m
WEIGHT	
Lbs per foot	Kgs per meter
54	81

MDS TL5 BRIDGE DECK IMPACT FORCES	
HORIZONTAL FORCE	61.8 kN/m
VERTICAL FORCE	116.0 kN/m
MOMENT	68.1 kNm/m
WEIGHT	
Lbs per foot	Kgs per meter
88	130

PROGRESSIVE SRS© TECHNOLOGY

MDS® BARRIERS incorporates a unique base attachment system called Progressive SRS© (Stress Reduction System) that dissipates vehicle impacts in order to reduce the impact forces that are redirected to the vehicle while providing very little disruption to bridge decks.

Progressive SRS© is unlike any barrier, the design and behavior of MDS® BARRIERS under impact is unique to what we typically would not expect from crash barriers. Standard steel barriers generally rely on the "stiffness" or "torsional rigidity" of a barrier which is logical, but the stiffness and hardness of the barrier also transmits impact forces back to the vehicle and into the bridge deck developing excessive pulling forces on the bridge deck that can create severe or even hidden damage and excessive costs for repair.

As our highway infrastructure evolves, more attention is being geared towards the impact forces that are redirected to a vehicle under impact. Crash attenuators mounted on the back of a truck are an excellent example. If concrete barriers are so great, why wouldn't they be mounted on the back of a highway work truck? As an example if a vehicle loses control while driving down a highway would it be safer to impact into a concrete barrier mounted on a back of a highway work truck that is parked along side of a highway, or would it be safer to hit an energy absorbing crash attenuator?

Although the choice is obvious, having an "energy Absorbing Barrier" designed as a road barrier is the transition and the next evolution in our road infrastructure system.

How does Progressive SRS© work?

MDS® TL4 & TL5 barriers are designed to provide exceptional energy absorption capabilities from its design which is referenced to SRS©. The impact force level from cars, trucks and buses are based on 3 energy absorption stages initiated by the intensity of the impact.

STAGE 1

Based on a chain of events the ribs located on the face of the barrier "V Cuts" are the first to absorb energy during impact as they will begin to flatten

STAGE 2

As the impact pressure increases the vertical ribs behind the barrier will start to deform and collapse inwards.

STAGE 3

The additional force of a heavy impact will then break off the anchor rods allowing the remaining energy to be transmitted into the adjacent barriers.

The combined energy absorption stages of the MDS® barrier design relieves an amazing 6X of bridge deck pull stress under impact when compared to concrete.

The MDS® TL4 & TL5 barrier deflection from the FHWA test report is 12.59 inches (320mm) from the front face inward. The barrier base width is 19 inches, therefore the impact is fully absorbed from the front. The same principle as a crash attenuator.

For full test data report, please contact us at info@mdsbarriers.com
Or call 860-289-8033

www.MDSBARRIERS.com